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Oil-in-Ice Demonstration IV Quick Look Report

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Homeland Security

N O T I C E

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16. Abstract (MAXIMUM 200 WORDS)

This quick look report describes the US Coast Guard Research and Development Center's fourth oil-in-ice demonstration that was held in Narragansett Bay near Newport, Rhode Island during August 2016. This demonstration was made possible through collaboration with other Coast Guard units and private industry. It was an on-water effort conducted to evaluate the responders' ability to integrate and operate multiple pieces of oil spill response equipment adapted for the cold weather while underway on U.S. Coast Guard Cutter JUNIPER. New oil recovery tactics, improved storage capabilities, and cold weather decontamination procedures for spill responders were explored. Specific equipment included an Ice Management System (IMS) designed to protect a skimmer from ice damage and two temporary storage tanks (TSTs) that were erected on JUNIPER's deck to avoid punctures by ice. The demonstration produced many valuable lessons learned that are applicable to ice-infested waters within the continental United States and in the Arctic waters of Alaska. These lessons learned are captured in this report and recommendations are made for further improvement for response to oil spills in icy waters.

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EXECUTIVE SUMMARY

In the northern climates of the United States, the Coast Guard (CG), Environmental Protection Agency (EPA), and local agencies are required to respond to oil spills during the winter months. Reduced ice during some seasons may increase vessel and barge traffic, increasing the likelihood of spilled oil reaching navigational waters like harbors and rivers. These factors, along with an aging pipeline infrastructure, increase the potential for accidental discharges of oil. To address these concerns, responders in the northern climate regions are continuously evaluating the newest available equipment and techniques.

Most recently, the RDC conducted a technology demonstration at Naval Station Newport (NSN) in Rhode Island with the United States Coast Guard Cutter (USCGC) JUNIPER as a working platform. It was an on-water effort conducted to show the integration of multiple pieces of equipment designed to recover and store oil in ice infested waters on a U.S. Coast Guard buoy tender with ice breaking capability. The RDC also explored new oil recovery tactics, improved storage capabilities, and cold weather decontamination (DECON) procedures for spill responders.

The primary objective was to evaluate the responders' ability to integrate and operate multiple pieces of oil spill response equipment adapted for the cold weather while underway on a Coast Guard vessel. The RDC also evaluated the performance of the equipment itself. Additionally, responders followed a DECON procedure tailored specifically for a 225-foot Coast Guard buoy tender. The lessons learned will be applied to other types of response vessels.

While underway in the Narragansett Bay, the vessel's crewmembers deployed the Ice Management System (IMS) that included a DOP-Dual Helix cold-weather skimming system and erected two temporary storage tanks (TSTs) of different sizes on its deck. The DECON procedure evaluation was carried out when the ship returned to port. Overall, the Demonstration Team successfully carried out the integration of the oil spill response equipment during the demonstration.

RDC identified lessons learned and made recommendations for further improvements. It is suggested that improvements to the new equipment can be used on a buoy tender in Alaska for an oil spill response in the Bering Straits or off the North Slope. Little to no response support would be available in such a remote location; therefore the design of the new equipment would need to be simplified for better storage in the ship's hold, easy assembly and deployment. Suggestions such as using the hold for oil storage may be problematic in that the entire hold would need to be emptied. However, having a system that lines the storage hold could increase storage capacity and keep the recovered oil warm, making it easier to offload later.

A response system especially for the Great Lakes or First CG District could be designed with fewer components and stored on land in a warehouse. The design would be sized to be easily transported by truck or C-130 aircraft and taken to pierside for loading onto the responding WLB. However, this could be problematic for Alaska as some locations do not have heavy lift capability, such as cranes or forklifts.

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CG	Coast Guard
CO	Commanding Officer
CONOPS	Concept of Operations
DC	Demonstration Coordinator
DECON	Decontamination
DT	Demonstration Team
EPA	Environmental Protection Agency
FOSC	Federal On Scene Coordinator
gpm	Gallons per minute
IMS	Ice Management System
kn	Knots
lbs	Pounds
MPT	Marine Portable Tank
MOP	Measure of performance
NSF	National Strike Force
NSN	Naval Station Newport
PPE	Personal protective equipment
psi	Pounds per square inch
RDC	Research and Development Center
SORS	Spilled Oil Recovery System
TBD	To be determined
TST	Temporary storage tank
U.S.	United States
USCGC	United States Coast Guard Cutter
VOO	Vessel of Opportunity
WLB	Coast Guard 225’ Seagoing Buoy Tender
XO	Executive Officer

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1 BACKGROUND

In the northern climates of the United States, the Coast Guard (CG), Environmental Protection Agency (EPA), and local agencies are required to respond to oil spills during the winter months. Reduced ice during some seasons may increase vessel and barge traffic, increasing the likelihood of spilled oil reaching navigable waters like harbors and rivers. These factors, along with an aging pipeline infrastructure, increase the potential for accidental discharges of oil. To address these concerns, responders in the northern climate regions are continuously evaluating the newest available equipment and techniques. The Coast Guard Research and Development Center (RDC) performed a series of oil-in-ice demonstrations in the Great Lakes during ice seasons since 2011 to evaluate those techniques and equipment.

In April 2011, the RDC held the first oil-in-ice demonstration in the waters near CG Sector Sault Ste Marie in Michigan. The three-day exercise involved oil spill response equipment to be used in broken ice conditions. A select group of Oil Spill Response Organizations (OSROs) demonstrated several pieces of equipment; and it was quickly learned that the cold weather had adverse impacts on the equipment and responders (Reference 1).

During January 2012, a second demonstration/workshop was held in the Straits of Mackinac near St. Ignace, MI. It built on the lessons learned from the first demonstration and included the deployment of multiple pieces of equipment while utilizing several vessels. Results from this effort included valuable lessons regarding logistics, equipment performance in ice infested waters, and tactics for recovering oil interacting with rubble and sheet ice (Reference 2).

The RDC returned to the Straits of Mackinac for the third oil-in-ice demonstration during February 2013. In collaboration with other Federal, state, and local agencies, private industry, and international interested parties; the CG gained practical knowledge and field experience in the coordination and operation of equipment. The CG also explored techniques applicable to the recovery of oil spills in ice-infested waters. The effort resulted in the demonstration of a variety of equipment, including skimmers, remotely operated vehicles (ROVs), and an ice detecting radar to name a few. They were deployed in different ice conditions, such as rubble and sheet ice. Warming shelters were used to aid responders in carrying out the demonstration. Overall, the exercise increased the CG knowledge base relevant to oil spill response in ice-infested waters within the continental United States and in the Arctic waters of Alaska (Reference 3).

1.1 Introduction and Objectives

This fourth oil-in-ice demonstration was an on-water effort conducted to show the integration of multiple pieces of equipment designed to recover and store oil in ice infested waters on a U.S. Coast Guard buoy tender with ice breaking capability. New oil recovery tactics, improved storage capabilities, and cold weather decontamination (DECON) procedures for spill responders were explored. The primary objective was to evaluate the responders' ability to integrate and operate multiple pieces of oil spill response equipment adapted for the cold weather, while underway on a Coast Guard vessel. The performance of the equipment itself was also evaluated. Additionally, responders followed a DECON procedure tailored specifically for a 225-foot Coast Guard buoy tender; but lessons learned will be applied to other types of response vessels. The original DECON issues that spurred this demonstration originated from personnel performing DECON on small tugboat platforms.

This multi-day demonstration took place at Naval Station Newport (NSN) in Rhode Island with the United States Coast Guard Cutter (USCGC) JUNIPER as a working platform. It is a 225-foot buoy tender (CG Buoy Tender (WLB-201)) with ice-breaking capabilities. See Appendix C for more details about USCGC JUNIPER.

While underway in the Narragansett Bay, the vessel's crewmembers deployed the Ice Management System (IMS) that included a DOP-Dual Helix cold-weather skimming system and erected two temporary storage tanks (TSTs) of different sizes on its deck. The DECON procedure evaluation was carried out when the ship returned to port. This effort identified equipment, techniques, and procedures suitable for both Arctic and Great Lakes environments, or other regions in the United States where ice may be present. The outcome of the cold weather decontamination procedure can be applied not only to USCGC crewmembers but also responders on Vessels of Opportunity (VOOs).

Observers included representatives from the RDC's partners at Enbridge Pipeline, the First District NOAA Scientific Support Coordinator and the First District Response Assistance Team (DRAT).

1.1.1 Oil-in-Ice IV Demonstration Objectives

The overarching goal of the demonstration was to establish the integration of multiple oil spill response equipment designed for use in icy conditions. The necessary items to carry out a cold weather DECON procedure, including two shelters of different sizes, were also used during the demonstration. A total of nine specific objectives were established prior to the demonstration and are listed below.

- Objective 1: Determine the difficulty of equipment setup and how well the Ice Management System integrates with the temporary storage tanks during simulated oil spill response operation.
- Objective 2: Establish and verify optimal locations for the two temporary storage tanks on the deck of USCGC JUNIPER.
- Objective 3: Safely deploy the Ice Management System from the deck of USCGC JUNIPER during underway operations.
- Objective 4: Collaborate with equipment vendors to ensure the appropriate tools, equipment, and personnel can support the simulated oil spill response operation.
- Objective 5: Perform DECON procedure and identify issues with cold weather personal protection equipment, if any.
- Objective 6: Determine operating procedures for future oil spill response operations.
- Objective 7: Train support personnel in the deployment and use of all equipment.
- Objective 8: Identify training areas and communication needs.
- Objective 9: Compile lessons learned into recommendations for improving oil recovery equipment, tactics, execution, etc.

1.2 Tactics Exploration and Demonstration Concept

This demonstration focused on a scenario that involves spilled oil in ice-infested waters, requiring the use of modified oil spill response equipment and personnel outfitted in cold-weather gear. Although no oil surrogate was used and ice was not present, the demonstration tested the Coast Guard's ability to integrate the Ice Management System with the temporary storage tanks during an oil spill response operation. At the conclusion of the recovery operations, responders followed a modified DECON procedure adapted for the cold weather.

1.3 Demonstration Schedule

Table 1 contains an overview of the schedule for the field demonstration.

Table 1. Demonstration schedule.

Thursday	**Friday**	**Sunday**	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
8/4/16	**8/5/16**	**8/7/16**	**8/8/16**	**8/9/16**	**8/10/16**	**8/11/16**	**8/12/16**
			Day 0	*Day 1*	*Day 2*	*Day 3*	*Day 4*
Organizing teleconference	Shipped equipment arrives at Naval Station Newport	Personnel Travel	Transfer equipment to vessel / Setup / Kickoff Meeting	Complete setup / Dry run	Continue dry run (Underway demonstration canceled due to weather)	Underway Demonstration / Tear-down / Pack out	Finish tear-down / Pack out / Depart

JUNIPER officers had safety concerns that weather conditions would prevent the demonstration from being held while underway for winds in excess of 20 knots and lightning. On Wednesday afternoon, severe thunderstorm warnings were in effect; so it was decided that the ship should remain in port. The official demonstration was postponed until the next day.

1.4 Measures of Performance

Measures of Performance (MOPs) that were considered for this exercise are listed in Table 2. MOPs were extracted from Reference 1 and modified to account for the expected ice-free conditions in Newport, RI.

Table 2. Measures of performance.

MOP	Remarks
Developmental stage	Prototype or production
Size	Weight and cube
Storage	Size and long-term durability
Transportability	Self-contained, air-, or truck-transportable
Difficulty in handling	Number of personnel; forklift requirement
Overall quality	Ruggedness, environmental suitability, simplicity
Viability of procedures	
Underway transport	Deck space requirements, time to load
Launch	Number of personnel, heavy lift requirement, time required
Positioning	Vessel movement, boom manipulation
Hose handling and connection	Time and number of personnel required
Retrieval	Number of personnel, heavy lift requirement, time required
Clean-up	Time and number of personnel required, need to move off-site
Pack-up and storage	Time and number of personnel required
Wave handling and stability	Reduction in effectiveness at wave heights
Operating time	Time between refueling, maintenance, parts replacement
Liquid capacity	Storage and lightering
Overall system performance	Start-up time/complexity, maintenance requirements/down time, reliability, safety
Adjusting settings	Ease and accuracy of on-the-fly changes
Ease of operation	Number of personnel and training required for steady-state operation
Reliability	Structural integrity and consistency or performance
Safety	Exposure to noise, hot components, high pressure, electrical

1.5 Participants and Roles

1.5.1 Demonstration Team (DT)

The demonstration team (DT) made daily decisions for execution of daily operations. Representatives met early each morning on the pier at the Naval Station Newport (NSN Pier Two, Newport, RI 02841) and then briefed other personnel. The group consisted of:

- Research & Development Center (RDC) Representatives
- National Strike Force Representatives
- WLB Commanding Officer (Afloat Commander)
- CG District One District Response Advisory Team (DRAT)
- Surface Integrated Logistics Command (SILC) Waterways Operations Product Line Representative

2 GENERAL INSTRUCTIONS FOR DEMONSTRATION SCENARIO

Table 3 provides general instructions for the demonstration scenario.

Table 3. General instructions for demonstration scenario.

Date:	Week of 8 August 2016
Start Time:	0800 daily (0730 for RDC team)
Location:	Narragansett Bay near Naval Station Newport (Figure 1)
Scenario: Because this effort was a demonstration of oil recovery/storage tactics and equipment, a specific, detailed ICS-based scenario was not presented. No ice was expected in the Newport region. It was expected that the DT would perform the demonstrations both at the pier in Naval Station Newport and while underway in the Narragansett Bay. Each day, the DT would determine the suitability of local conditions for the activities to follow IAW the nine stated objectives, and decided what should be done for the day to achieve them.	

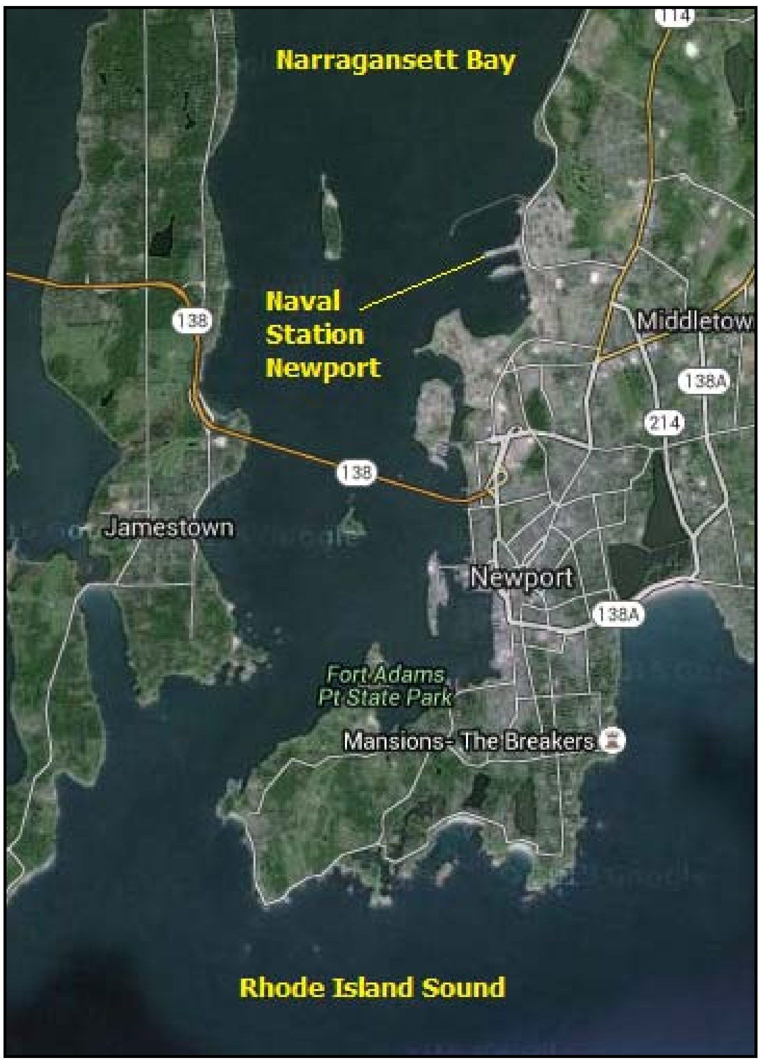

Figure 1. Newport demonstration operating area.

2.1 Demonstration Procedures

The demonstration participants arrived at the pier next to the ship (Figure 2) on Monday morning and a kickoff meeting was immediately held. All the necessary equipment was loaded onto the deck of JUNIPER and assembly began. The ship's crane was used all day to transport equipment and to assist with the IMS set up. The next day, assembly was finalized and the skimmer was integrated into the IMS by crane. A deployment dry run was performed while the ship was in port to determine how to manage the hose connected to the skimmer with limited space on the deck.

There was limited activity on Wednesday as heavy thunderstorm warnings were in effect. In the morning when the weather was clear, the crane was utilized to deploy the skimmer with the IMS into the water. The dry run helped to determine how to manage the hoses and where the IMS and skimmer should be positioned on the deck for maximum efficiency.

The underway demonstration took place on Thursday where a TST was filled halfway with freshwater, and the skimmer and IMS system deployed into the Narragansett Bay. When the ship returned to port, the DECON demonstration was carried out. The detailed demonstration plans for the multiple equipment and DECON procedures are included in Appendices A and B.

Figure 2. Naval Station Newport pier.

2.2 Area of Exercise

The underway demonstration site is marked with a red circle in Figure 3 near Gould Island. The officers of USCGC JUNIPER decided that the area near Gould Island, a thirty-minute transit from Naval Station Newport, would be an ideal site to deploy the Ice Management System due to low vessel traffic and gentle wave conditions.

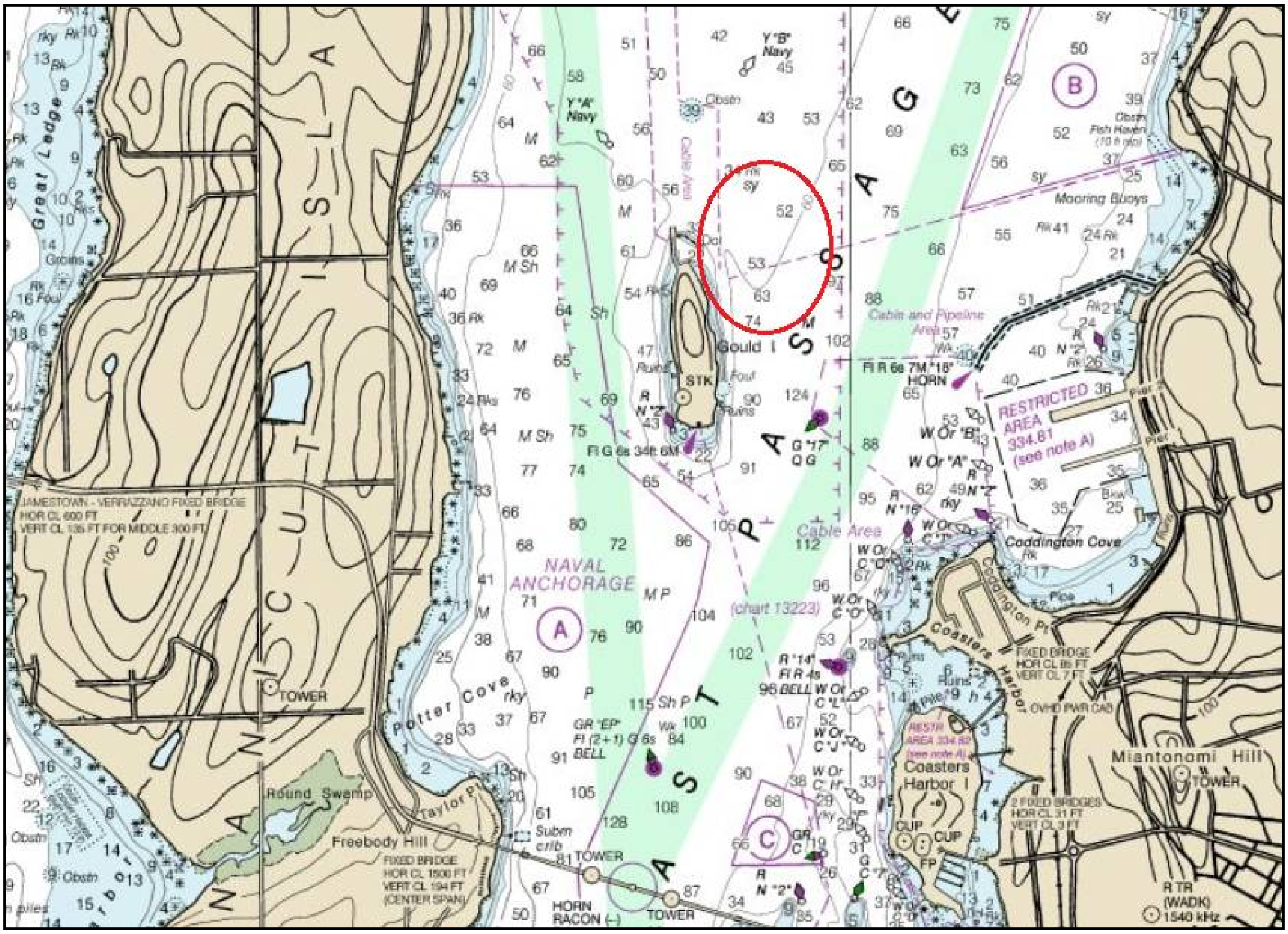

Figure 3. Operating area.

2.3 Vessel Deck Layout

For oil spill incidents in non-Arctic conditions, CG 225' buoy tenders deploy their Spilled Oil Recovery System (SORS), which includes a DESMI Terminator skimmer, a Canflex flexible bladder for oil storage, Fast Sweep Boom, a control stand, hydraulic hoses, and an outrigger arm. Crewmembers of 225' buoy tenders are familiar with the equipment and how they should be assembled, positioned on the deck, deployed, and operated. However, for a response to an oil spill in Arctic conditions with icy waters, different equipment and tactics need to be used. In freezing conditions, decontamination of responders and equipment cannot be performed with water; dry decontamination procedures need to be followed.

Prior to the demonstration, RDC proposed the following deck layout with the temporary storage tanks, ice management system and the DECON shelters in Figure 4. It was anticipated that the port side of the ship would be reserved for the TSTs while the starboard side would be used for the Ice Management System and the Helix skimmer. It was thought that the skimmer container (ISU90) would be kept onboard during skimming operations to serve as a shelter as well as keeping spare parts at the ready. With plans for deployment of the IMS off the starboard side, the control panel was kept on the starboard side as well.

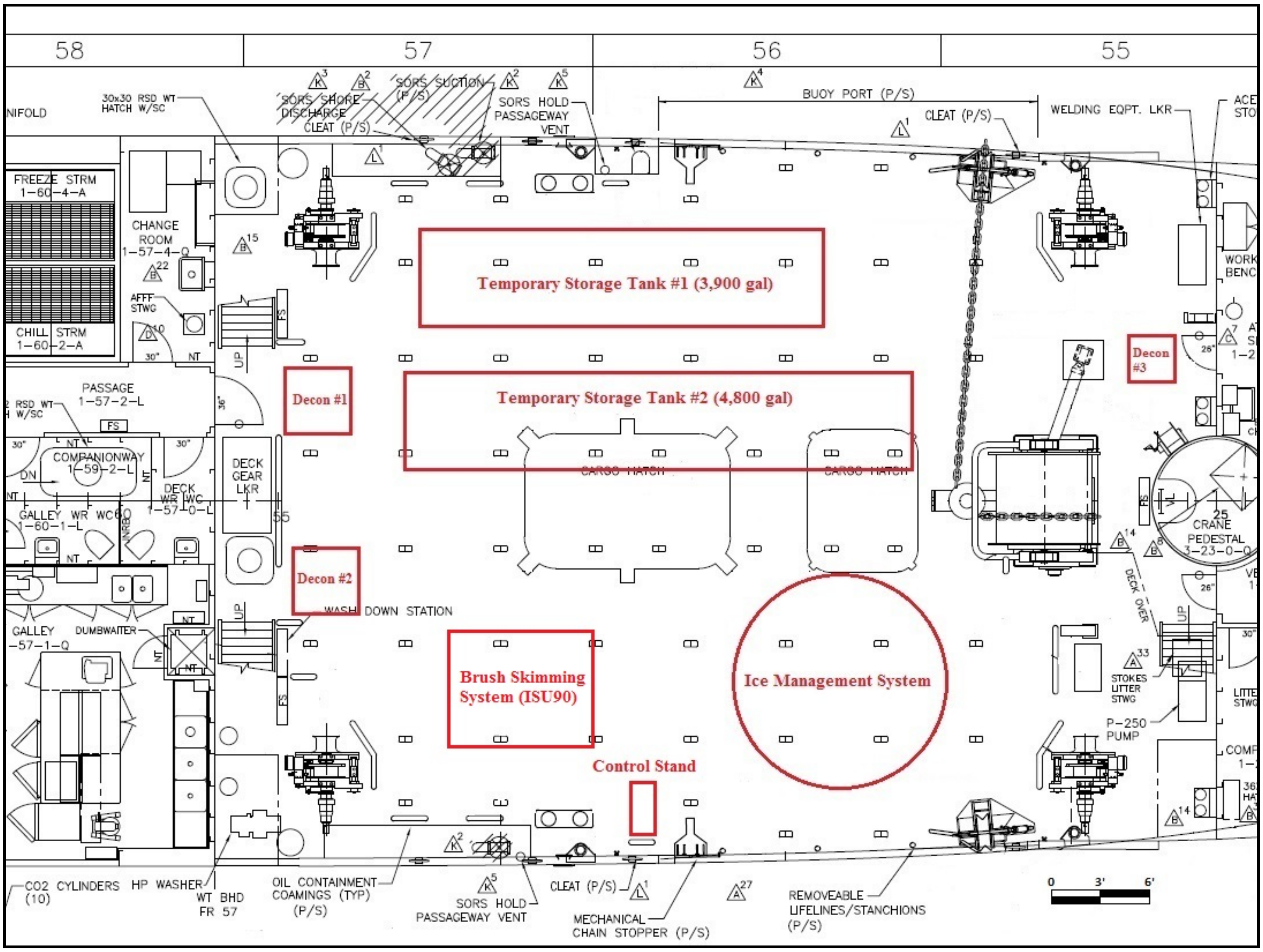

Figure 4. Original 225' Buoy Tender deck layout with new equipment (vessel bow is to the right).

As the demonstration progressed, the DT concluded that careful hose planning and management were crucial for a successful and safe deployment, due to limited deck space. In addition, concerns were raised about the location of the temporary storage tanks that could limit egress and access to emergency equipment if an emergency occurred. As a result, there were changes to the original layout with the DECON shelters moving forward towards the bow, and the smaller TST being placed aft and running lateral across the deck. The larger TST was placed on the far port side of the deck in order to make as much space for the IMS and skimmer as possible. The skimmer container was removed from the deck and the IMS relocated to the center of the deck. This freed up more space on the starboard side of the deck to improve the ease of hose management, making the deployment of the integrated skimmer system easier. Also, the establishment of the DECON shelters provided a clear barrier between the COLD zone (clean, uncontaminated area) from the HOT zone (working area). See Figure 5 for the actual layout that was used during the underway demonstration.

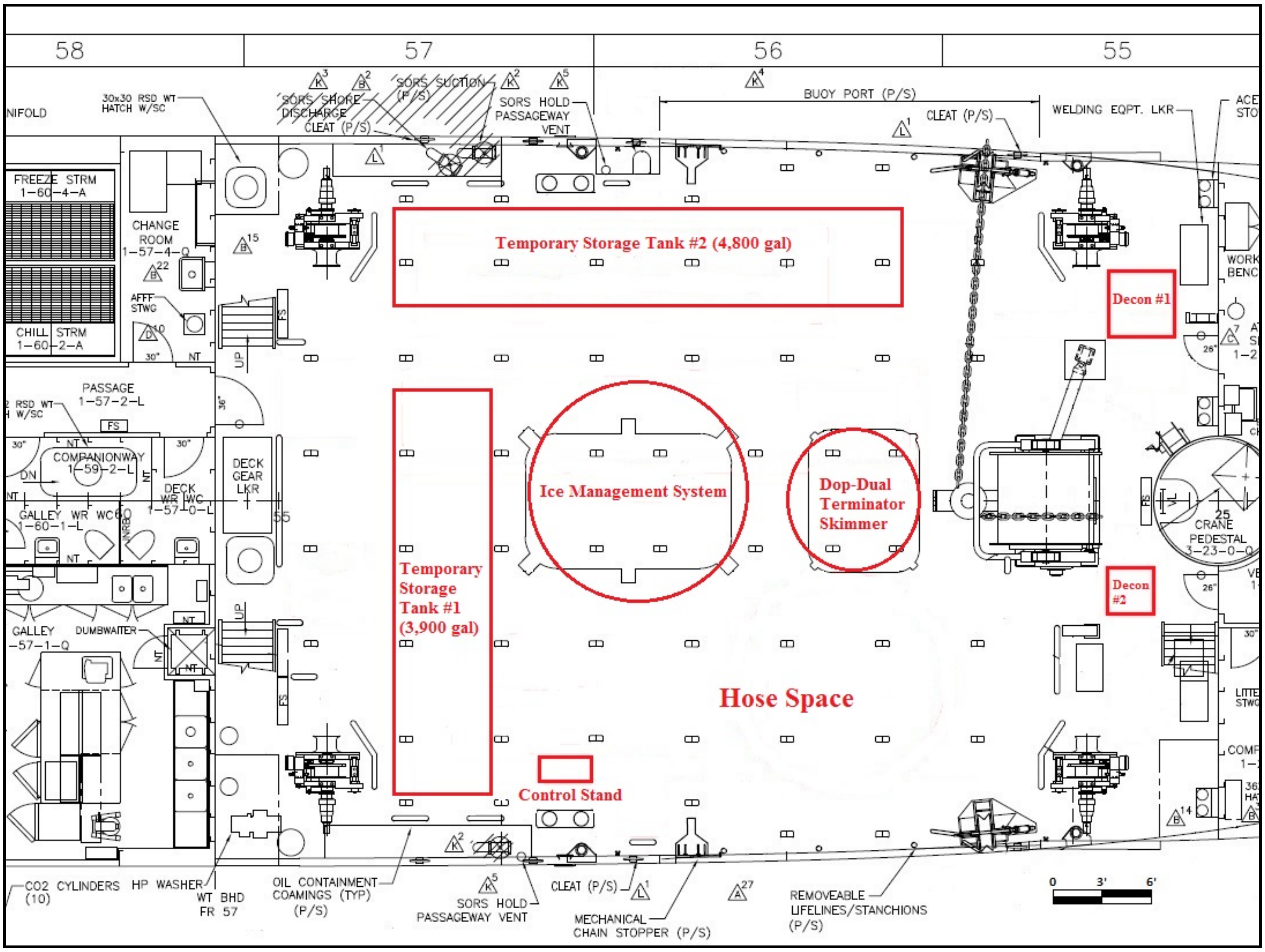

Figure 5. Actual 225' Buoy Tender deck layout with new equipment (vessel bow is to the right).

Figure 6 shows a photograph of the deck from the top of the bridge. Hose management became more difficult with the inclusion of a 25 foot section of the six-inch stainless steel chemical hose. During a cold-weather response, a chemical hose would be used in place of a collapsible rubber hose to prevent the hose from being clamped shut due to freezing when not in use. Since the chemical hose is less flexible than a rubber hose, a larger deck area is needed to maneuver the integrated skimmer system. In Figure 6, note that the DECON shelters are not yet established.

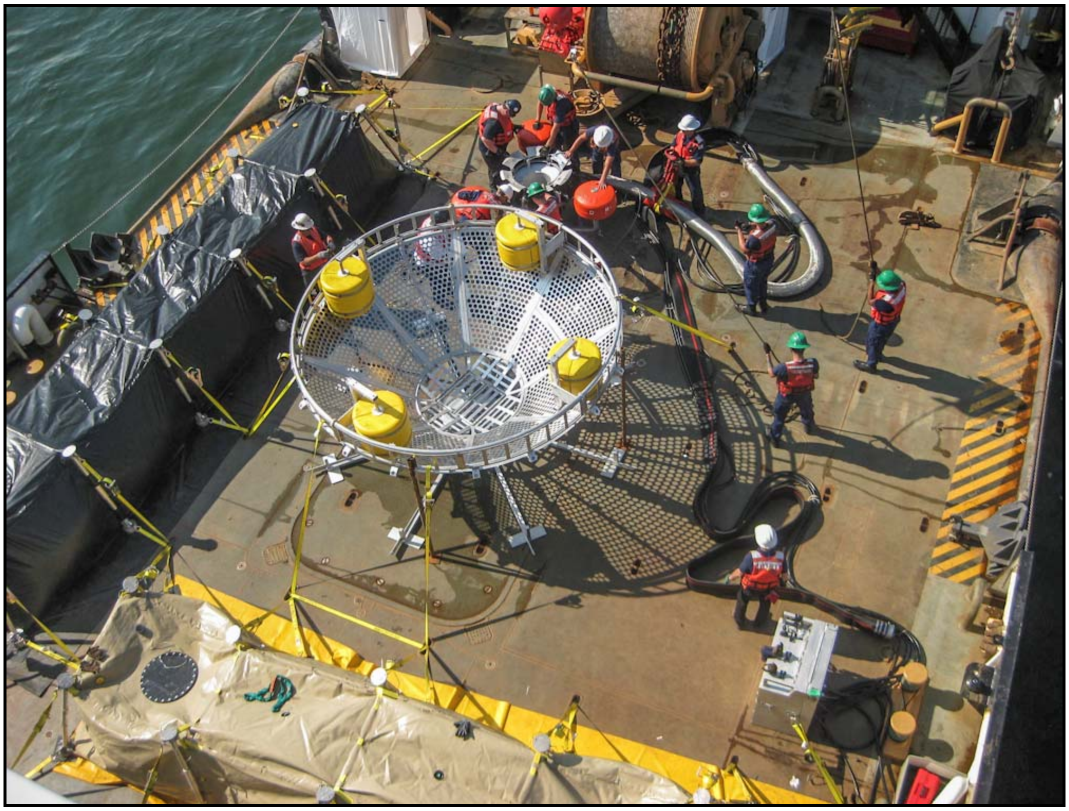

Figure 6. Actual deck layout with new equipment as seen from above.

2.4 Results

This oil-in-ice demonstration, although performed in an area without ice, primarily focused on the integration of equipment designed for an oil spill response in Arctic conditions. ELASTEC designed and manufactured the TSTs according to Coast Guard's specifications (see Appendix A) so that recovered oil may be stored in containers on a ship's deck. This approach is proposed as an alternative to the Canflex bladder that is dragged through water next to the ship to avoid the risk punctures from ice floes. This storage alternative is also better than using a full-sized barge tied off to one side of the ship as was used during the Deepwater Horizon response. The placement of a barge would make maneuverability extremely difficult in broken ice.

Marine Pollution Control (MPC) designed and created the IMS (see Appendix A). The original prototype was tested at the Ohmsett test facility in March 2015 and lessons learned were applied to improve the prototype for use in this demonstration. The IMS was successfully able to integrate with the National Strike Force's (NSF) DOP-Dual Helix skimmer and the overall system was deployed off the ship and into the waters of Narragansett Bay. Lastly, the DECON procedures were carried out on the deck with JUNIPER crewmembers and NSF members using blue marker chalk as the oil surrogate. Capabilities and limitations of all equipment and procedures were identified during the demonstration, and are captured in Section 2.5 Lessons Learned of this report. Each objective for the demonstration was successfully met.

***Objective 1:	Determine the difficulty of equipment setup and how well the Ice Management System integrates with the temporary storage tanks during simulated oil spill response operation.***

Each temporary storage tank took approximately two to three hours to be unpacked, rolled out, and fully erected after they were transported onboard the ship by crane. Considerable physical exertion was needed to join the parts together and secure each structure to the deck with straps. There were many small parts needed for assembly and workers used their bare hands to fit them together, which would not be possible in cold weather. Observers noted that this would be extremely difficult in sub-freezing temperatures with bulky glove wear. Figure 7 shows the parts needed for assembly for both TSTs. Figure 8 demonstrates the manpower required for a TST assembly.

Figure 7. Parts needed for assembly for both temporary storage tanks.

Figure 8. 3,900-gallon temporary storage tank being assembled.

The shipping containers for the IMS were transported to the deck by crane, and then removed when parts and pieces were unpacked. Similar to the TST assembly, IMS assembly was very complex. Small parts for the IMS came in separate boxes and required multiple steps to construct (see Figure 9).

Figure 9. Some of the parts needed for assembly of the ice management system.

Those familiar with the IMS were needed to guide the setup process, since it needed to be assembled in a certain sequence. Once the cone portion of the system was put together, a crane was needed to connect the top ring to the cone to finalize the set up (see Figure 10). Overall, the setup of the IMS took approximately four to six hours without any setbacks and the crane readily available. Since the system was comprised of many pieces, careful consideration was needed in order to put the correct pieces together in the correct order. In colder weather, the difficulty of setup would increase due to bulky gloves required by the workers to stay warm and frequent rotations of work crews.

Figure 10. Ice management system being assembled with use of a crane.

The DOP-Dual Helix skimmer and the control stand were unpacked and assembled on the pier, and then transported to the deck by crane. The NSF crew was very experienced and quickly put the system together in short time (approximately 1 hour) and kept it out of the way while other specialized equipment was being assembled (see Figure 11). The skimmer setup is routine for the NSF and has been performed in previous cold-weather operations.

Figure 11. DOP-Dual Helix skimmer assembled and ready for integration.

As the equipment was being assembled and the deck layout became finalized, it was decided that the hose for the skimmer should not connect with one of the TSTs, as a manifold with valves would serve as a better solution when two TSTs are on deck. Instead, fresh water from the ship was used to fill up the larger TST halfway to serve as a worst-case scenario to simulate the movement of the oil during the ship's movement. Filling the tank halfway would provide a free-surface effect, meaning the contained liquid is free to move around in the TST with force as the ship rolls with the waves. This may cause damage to TST's structure and integrity. The smaller TST was partially filled with air to demonstrate its shape when full of liquid. During the underway demonstration, the larger, half-full TST proved to be stable and did not interfere with the deployment of the IMS/DOP-Dual skimmer system. Figure 12 shows the two TSTs.

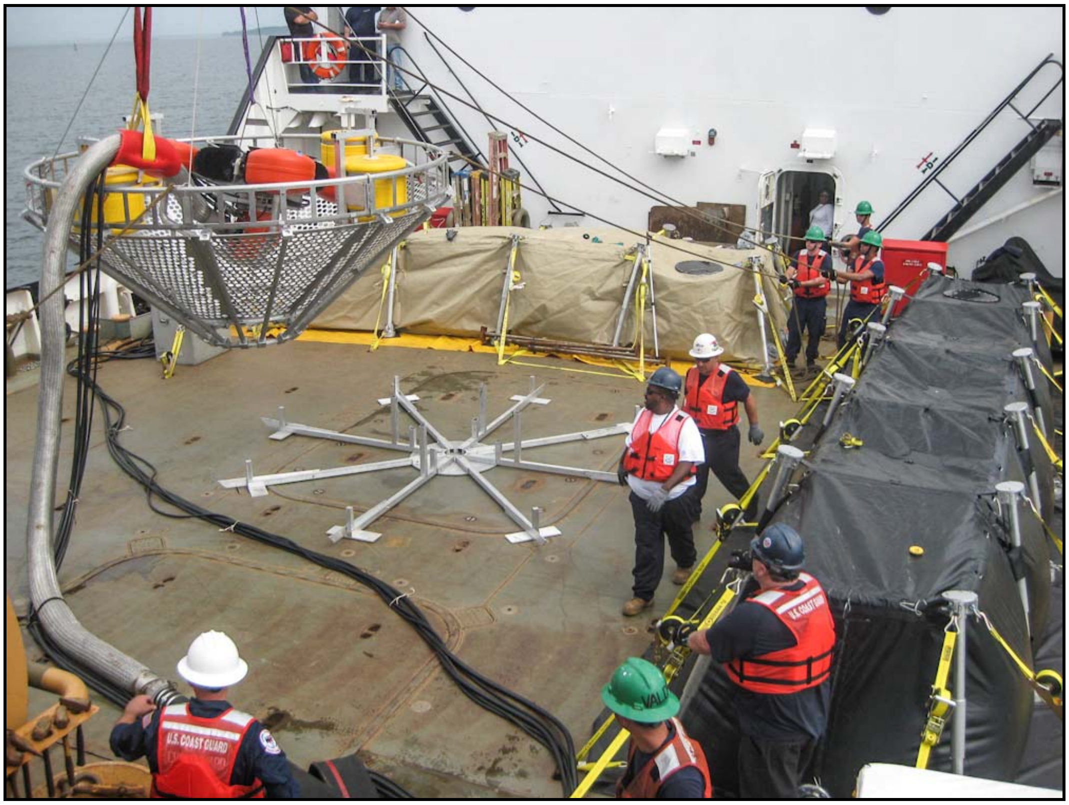

Figure 12. Two temporary storage tanks fully erected on the deck during the underway demonstration.

Objective 2: Establish and verify optimal locations for the two temporary storage tanks on the deck of USCGC JUNIPER.

The original deck layout (see Figure 4) had both TSTs on the port side of the ship so the IMS may be deployed off the starboard side. However, as the setup progressed, it was quickly realized that more deck space was needed for the IMS and skimmer, since the rigidity of the stainless steel chemical hose and the length of the rubber hose attachment were not considered in great detail. A large section of the deck needed to be reserved for hose space. In Figure 13, the chemical hose is taking up space where the larger TST (black tank) is supposed to run parallel to the smaller TST (tan tank).

Figure 13. Deck layout in the early planning process.

The deployment of the skimmer was limited due to lack of hose space, even if the skimmer was moved so that the larger TST was situated next to the smaller one. The skimmer and IMS needed to be positioned so that the hose and hydraulic lines did not inhibit the integration and deployment of the system. As a result, the smaller TST was moved aft of the deck and ran lateral across the deck to gain more deck space for the skimmer and IMS (see diagram in Figure 5 and view from the top of the bridge in Figure 6). The IMS was relocated to the center of the deck with the Helix skimmer just forward of the IMS. The entire starboard side was reserved for hose placement and clearance for deployment.

Objective 3: Safely deploy the Ice Management System from the deck of USCGC JUNIPER during underway operations.

On Thursday August 11, USCGC JUNIPER got underway and traveled 30 minutes to the waters northeast of Gould Island. Once the ship reached the designated location, the crew worked to integrate the DOP-Dual Helix with the IMS (see Figure 14). The location for the hose saddle, as seen in Figure 14, is crucial as the hose needs to be lifted out of the way when the skimmer is placed inside the IMS. Some trial and error attempts led to the optimization of the saddle's location for best performance.

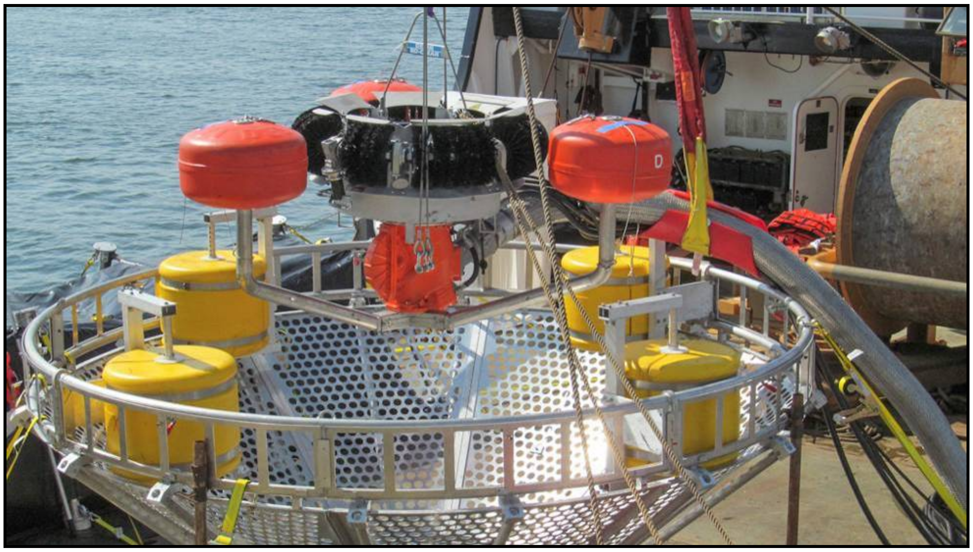

Figure 14. Integration of the DOP-Dual Helix skimmer and the ice management system.

Due to the revised deck layout and careful crane management, the deployment of the integrated system was successfully carried out safely and without issues. Figure 15 shows the progression of the integration to deployment.

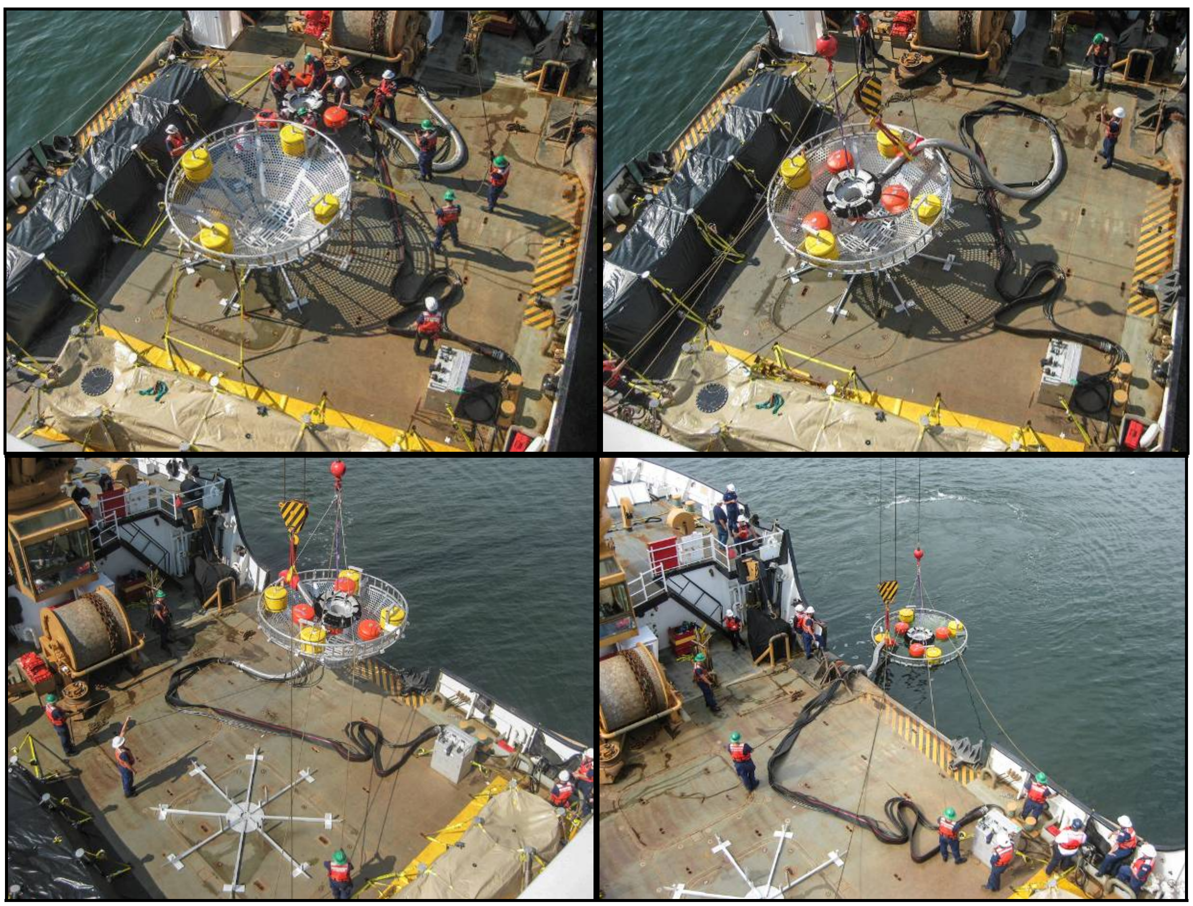

Figure 15. Progression of ice management system and skimmer integration and deployment.

Note: Careful consideration of hose management and clearing the starboard side of all equipment reduced risks of collisions with other equipment and simplified the deployment operation.

The figures show the control stand located in the aft region of the starboard side although it was not utilized during the demonstration, since the pump was not planned to be used. The evolution showed that the IMS/DOP-Dual skimmer system can be safely deployed off the ship; and that the hose could be easily connected to a manifold, had it been present, to store recovered oil inside the two TSTs. If needed, the stand for the IMS could be re-positioned (while the IMS is held suspended by a crane) with 3 or 4 persons during deployment to allow for more space for easier hose management.

Objective 4: Collaborate with equipment vendors to ensure the appropriate tools, equipment, and personnel can support the simulated oil spill response operation.

Representatives from each NSF Special Team (Atlantic Strike Team, Gulf Strike Team, and Pacific Strike Team) as well as a representative from the NSF Coordination Center were present for the demonstration. The Atlantic Strike Team members provided the DOP-Dual Helix skimmer, control stand, a 25-foot stainless steel chemical hose, and all the necessary tools and wires for assembly and operation. ELASTEC shipped the two TSTs to Naval Station Newport and two personnel were present to assemble the equipment. Marine Pollution Control (MPC) delivered the IMS and all tools and supporting equipment. It also provided three personnel to perform the setup and gave input on how the hose should be managed, based on previous experience.

RDC sent four people and all the necessary equipment to carry out DECON procedures onboard the ship. JUNIPER's crewmembers provided crane support and the necessary manpower to carry out the demonstration. The ship's officers were involved in the planning process with the RDC members, assisted with logistics, and determined the optimal weather for an underway operation.

Objective 5: Perform DECON procedure and identify issues with cold weather personal protection equipment, if any.

After the underway demonstration concluded with JUNIPER's return to the pier, the DECON procedures took place with five volunteers, two from the NSF and three from JUNIPER. Ideally, the shelters would not be located near doors that lead to dead ends, which was the case for the left shelter in Figure 16. However, with the smaller TST aft and running lateral across the deck, a shelter could not be placed in the aft region of the deck near the door that leads to the mess. In order to test the two different shelter sizes, both were placed forward on the deck near both doors. The larger shelter measured 48" x 48" x 81" and the smaller 36" x 36" x 77". Figure 16 shows the DECON setup, which provides a clear barrier between the HOT zone (working area) and the COLD zone (clean, uncontaminated area).

Figure 16. DECON shelters erected and COLD zone barrier established.

The DECON procedure was carried out with the equipment listed in Appendix B. Blue marker chalk was used to “contaminate” each volunteer. It represented oil that a worker would have picked up during a spill response. Figure 17 shows the blue marker chalk being applied to a volunteer.

Figure 17. Blue marker chalk (oil surrogate) being applied to a volunteer.

RDC followed the DECON procedure in Appendix B; but NSF recommended some changes, including how the coverall should be removed. Instead of tearing away the upper half of the coverall, a DECON line worker should roll the suit off the volunteer, starting from the head and working down to the torso area. The arm sleeves would be rolled off one at a time. Once both arms were free and the coverall was removed from the upper half of the body, the volunteer was directed to sit on a stool in the shelter for balance. The DECON line worker would assist in removal of the coverall from each leg. Once the volunteer's leg was free, the "clean" leg would be placed inside the shelter while the other stayed outside until the coverall suit was finally removed. With both clean legs inside the shelter, the volunteer would check himself/herself over for a spot check and used terry cloth rags to clean away any remaining spots. Finally, a DECON line worker in the COLD zone would open the shelter flap door and give the volunteer a final check before admittance to the safety of the ship. Figure 18 shows the progression of the dry DECON procedure.

Figure 18. Progression of the dry DECON procedure with a volunteer.

Each volunteer successfully entered the designated COLD zone with little to no traces of the blue marker chalk. Lessons learned and recommendations from the DECON procedures carried out during this demonstration are recorded in Sections 2.5 and 2.6.

Objective 6: Determine operating procedures for future oil spill response operations.

The deployment of the IMS/DOP-Dual skimmer system from the deck of USCGC JUNIPER helped the RDC to understand the extent of its skimming operations. During the underway demonstration, the system was deployed off the ship's starboard side using the ship's crane. The maximum length of the crane is 60 feet and the total hose length was approximately 75 feet long. To determine the maximum extent of skimming operations, two extreme ends were identified as Position A and Position B in Figure 19.

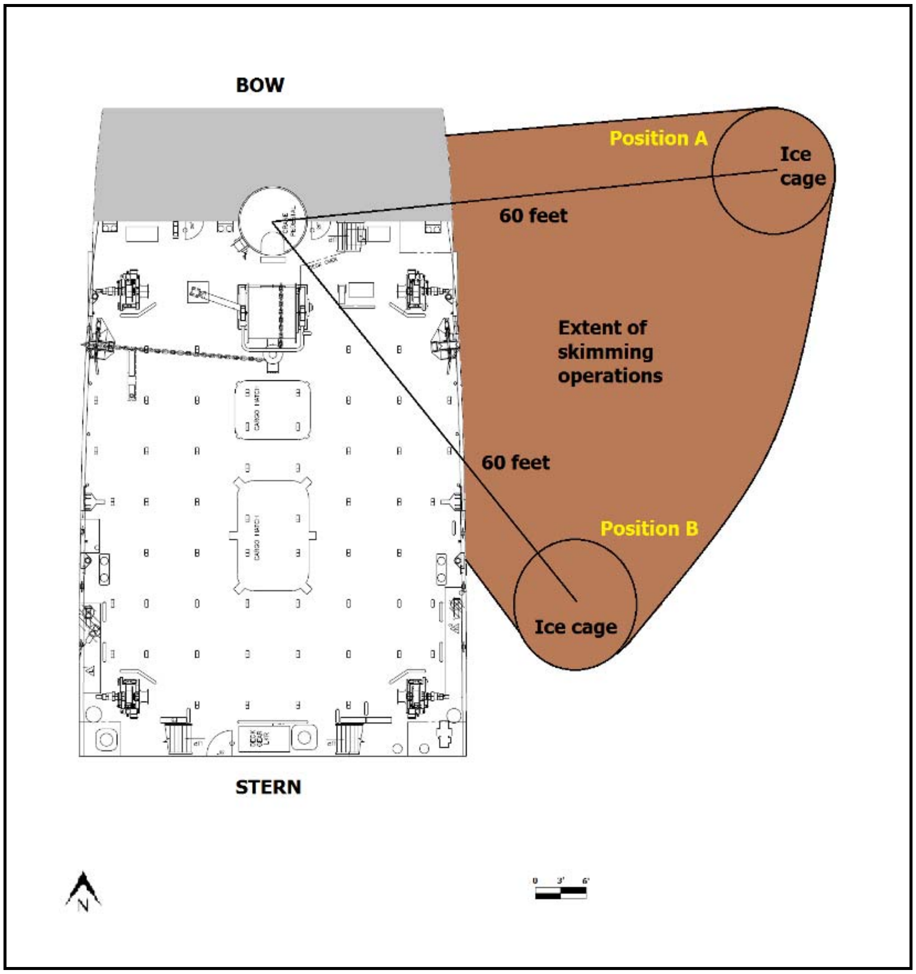

Figure 19. Extent of skimming operations with the IMS/skimmer system.

If the direction to the stern position from the crane operator is taken to be 0°, Position A is approximately 95° left of the direction to the stern, which is as far back as the crane can be operated. The deck width is 46 feet and one end of the deck is 23 feet from the crane operator. Thus, the crane can go as far as 37 feet out into the water. Position B is the other extreme end (approximately 47° left of the direction to the stern) that the skimmer can be moved before the IMS makes contact with the ship's side. The sweep angle between Position A and B was estimated to be 48°. Figure 19 shows the total area that the IMS/DOP-Dual skimmer system can operate in.

Discussions of potential operating procedures for Arctic-strengthened equipment will be included in an upcoming RDC product called "Federal On Scene Commander (FOSC) Guide for Oil in Ice". Scheduled to be released in the spring of 2017, it is a guidance document that will be designed to complement current existing guides based on the experiences from all oil-in-ice demonstrations conducted by the RDC. It will contain checklists, decision trees and references for use during a spill in ice in any area of the United States. Additionally, the guidance document will provide the specific guidance needed for both maritime and fresh water to enhance decision-making to ensure safe, quick and efficient responses during an oil spill.

Objective 7: Train support personnel in the deployment and use of all equipment.

The demonstration provided an opportunity for representatives from each NSF Special Team to work together with a crewmember of a 225' buoy tender and equipment vendors. They came together to understand some of the potential new equipment that may be available for responding to oil spills in Arctic conditions, how they may be deployed off a Coast Guard cutter, and what were their strengths and limitations. Figure 20 shows the mixture of demonstration participants, from the NSF to equipment vendors.

Figure 20. Mixture of demonstration participants working together.

Objective 8: Identify training areas and communication needs.

The IMS and TSTs required the assembly of many small pieces, and it needed be performed in a step-by-step manner, which can be confusing to the untrained responder. Training should be provided for the assembly of multiple components of the spill response system that were used in this demonstration.

No issues were identified with communications in this demonstration.

Objective 9: Compile lessons learned into recommendations for improving oil recovery equipment, tactics, execution, etc.

Sections 2.5 and 2.6 of this quick look report meet this objective.

2.5 Lessons Learned

Throughout the demonstration, participants provided feedback during setup, assembly, and deployment. A "hot wash" was held at the end of each day where participants gathered together and shared their thoughts and observations. Table 4 captures those lessons learned.

Table 4. Oil-in-Ice Demonstration IV lessons learned.

Equipment	Lessons Learned
Temporary Storage Tanks	• Need to reduce the number of parts and pieces for easier setup. Some parts should come pre-assembled; but need to consider how they may be packed for shipping. • Many straps were used to tie the TSTs to the deck anchors; they pose trip hazards, especially for people with heavy personal protective equipment (PPE) during cold weather. • A manifold with valves would have been very useful, as it would allow control of which TST would be filled during recovery operations. • Heat exchangers would be useful so hot water can be pumped into the storage tanks without mixing with the oil. • TSTs were easily rolled up during disassembly but still require 3-4 personnel. • The larger TST was filled halfway with fresh water to mimic a substantial free-surface effect; and the structure proved to be stable during the ship's underway demonstration. Once a final operational configuration is established, a review by appropriate CG Safety office is still needed.
Ice Management System	• Need to reduce the number of parts and pieces for easier setup. • Many nuts and bolts were used, which would be difficult for responders to work with during extreme cold weather. • Stand for the IMS takes up premium space on the deck, may need to consider a stand that takes up smaller deck footprint; one option suggested is a foam pad. • A containment area (berm or tent) is needed after the IMS contacts oil. • Hose for the skimmer would need one-way valves to keep oil from draining back down to the skimmer. • There may be difficulties with performing DECON on woven steel hose. • Location of the saddle for the hoses is crucial; will need to identify a predetermined location on the hose for the saddle and keep in place for future operations. • Umbilical management is critical; guide wires are suggested; something to encapsulate all hoses and wires would be useful. • Need to consider locations of tarps/dams/berms on deck to prevent excessive oil contamination from IMS and hoses. • 6" hose is probably too large; a smaller hose size may be needed to improve the ease of deployment, which could necessitate use of a smaller skimmer model. • Model 160 skimmer could fit better inside the IMS and make tethering easier compared to a model 250 skimmer, especially if the size of the hoses can be reduced (Note: This system can only handle 3-inch hose). • A hose reel would be useful for hydraulic lines. • Edges of the ice cage need to be made less sharp for crew safety.

Table 5. Oil-in-Ice Demonstration IV lessons learned (Continued).

Equipment	Lessons Learned
Decontamination Procedure	• DECON line workers proved to be very effective; they performed most of the DECON work while responders followed their instructions. • Simple Green cleaner or equivalent could be used to help the DECON line worker wipe down the gross contamination on the responder before the DECON line worker began to assist in removing the PPE. • Small collapsible containers are too flimsy; 30 gallon trash cans were suggested. • A lot of contaminated PPE will be generated, there is a need to store the hazardous material in a proper location until it can be offloaded from the ship. • Rolling the PPE off the responder (performed by the DECON line worker) may create less of a mess than cutting off the coverall suit. • DECON line workers need thin gloves to roll the PPE off the workers; but extreme cold weather poses a challenge for this need. • A berm is needed to separate the oil from the COLD zone. • Shelters may not withstand strong weather. • Shelter entrance was cut completely open and the exit was modified so that a flap door with Velcro was created; this flap serves as a barrier to keep the responder in the shelter until a DECON line worker stationed in the COLD zone gives the responder a final look-over before admittance. • A raised platform in between the shelter and the COLD zone is suggested. so that the decontaminated worker goes directly into the COLD zone without worry of tracking oil. • Pouches should be built into the side of the DECON shelter. • Mirror inside the shelter was not used because DECON line worker helped with pointing out contamination spots where responder could not see; thus mirror is not required. • Sturdier stools are needed; shelters need to be able to provide support to responders to help with balance as they sit down (see Figure 21). Shelter used during the demonstration was flimsy and barely provided balance support. • Everything needs to be tied down. • Smaller shelter (36” x 36” x 77”) was too small for a buoy tender; but this may be necessary on a smaller Vessel of Opportunity. • During DECON demonstration, two of four volunteers had minimal traces of chalk (oil) on their clothing. • Marker chalk worked well as an oil surrogate. • Boot covers work well for slippery surfaces, better than rubber boots.

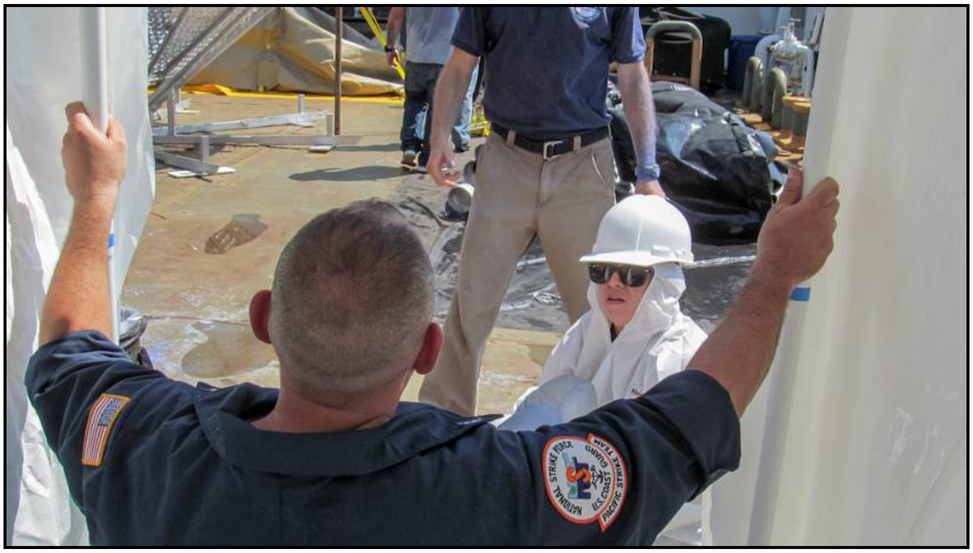

Figure 21. Volunteer using the shelter for stability support during the dry DECON procedure.

2.6 Conclusions and Recommendations

Temporary Storage Tanks

The deck layout with both TSTs and the ice management system was a challenge that was overcome with the re-positioning of the 3,900-gallon TST from the far port side of the deck to the aft and turned sideways. However, the TSTs required many strap tie-downs that prohibited the placement of a DECON station at the aft door that led inside to the mess deck. The tie-downs also posed safety hazards with risks of tripping responders wearing PPE designed for cold weather oil spill responses. The larger TST was filled halfway with fresh water and no stability issues were observed during the underway demonstration. Both TSTs required many small parts that would prove to be difficult to assemble in cold weather; as the equipment vendors in Newport used their bare hands for easier access. Responders wearing thick gloves in the cold weather may lengthen the setup time. However, both tanks were easily set up once all the small parts were in place. Additionally, each TST was easily transported from the pier to the ship on a pallet with a crane. Figure 22 shows that a TST packed and bound would not take up too much storage space and could be placed in the storage hold.

The amount of oil recovered from a spill response operation in icy waters is limited by the volume of the storage tanks on the ship's deck. In turn, the volume of storage tanks is limited by how much deck space that can allow for the storage and deployment of modified oil spill response equipment suited for the Arctic. It was quickly learned that deck space was limited during the demonstration. Adding a third TST with a volume of approximately 4,000 gallons is unlikely. The higher efficiency of the DOP-Dual skimmer will greatly decrease the amount of water recovered; but a full Concept of Operations (CONOPS) to keep the vessel on station as long as possible is still needed.

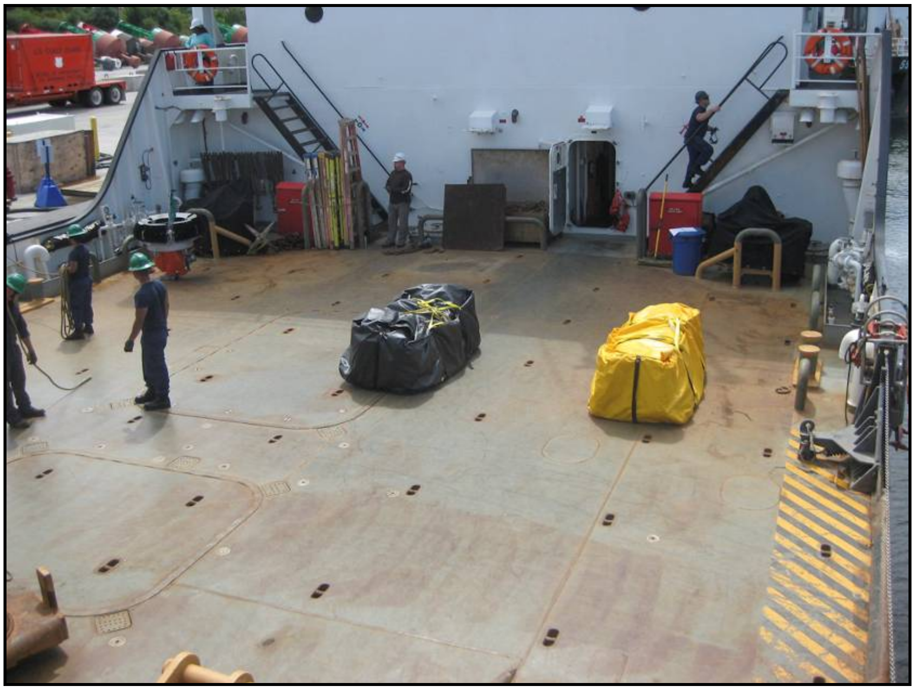

Figure 22. Temporary storage tanks packed and bound.

The RDC recommends that:

- Temporary storage tanks should be further explored for use in Arctic conditions, especially how they can be secured to the deck without causing trip hazards to workers on the deck.
- Some parts should come pre-assembled, so that responders would not need to follow detailed instructions and be forced to handle small parts.
- Partially filling the tank with air using a leaf blower should be incorporated into the setup procedure.
- The size, weight and center of gravity of these systems generally are inside the envelope for what was approved with the use of Marine Portable Tanks (MPT) during the Deepwater Horizon spill response; but a final analysis would still be needed, once the final configurations and arrangements are determined.

Ice Management System

The Ice Management System also required many parts and pieces that needed to be assembled in a specific order. Another part of the IMS that is critical is the management of the hoses. During the demonstration it was found that is was particularly important to identify the location of the saddle; in order for the crane operator to place the hoses in the correct location without needing the crew continuously making small adjustments.

- A reduction in parts and pieces should make assembly easier in cold weather and reduce the manpower required.
- While a stand is required to hold the IMS as it is being built, it is recommended that it is reduced in size in order to create more deck space for the crew to maneuver.
- While the saddle was used during the demonstration, in the future it would be best for all the hoses and wires to be encapsulated. This would ensure that all pieces move as one, which would reduce

slippage and entanglement; and also protect the hoses and wires from being damaged by ice.
- Once the IMS comes in contact with oil, it becomes critical that the contaminated equipment not increase the amount of oil spread across the deck through dripping. This can be minimized by using a berm or dam around the contaminated equipment on the deck to reduce the amount of oil spread by both the IMS and hoses.

Decontamination Procedure

From the demonstration, it was noted that DECON line workers play a major role in performing efficient decontamination of responders. During the procedure, the DECON line workers are expected to perform most of the DECON while the responders follow instructions. DECON line workers need to be especially helpful since it is anticipated that responders will have limited mobility due to additional PPE to protect them from the cold weather; and thus be more susceptible to slips, trips, and falls. Overall, the DECON procedures in Appendix B should be modified to include the following recommendations.

- Instead of the coverall suit being ripped off with a Talon knife; it was recommended that the suit be rolled off carefully by a DECON line worker. The line worker would have thin plastic gloves or garden gloves with rubber grips, so this rolling off may be carried out. Although the recommended gloves are not adequate in keeping their hands warm during extreme cold weather that the oil spill response may occur; the DECON line workers would come out to the deck only on an as-needed basis and work in 15 minute rotations.
- A sturdier structure is recommended as a cover for protection from the elements. The shelters used in this demonstration proved to be flimsy; and participants agreed that they wouldn't be able to withstand strong wintry weather or provide stability support to responders as they sit down. However, deck space would need to be considered for the more robust structures.
- If DECON is performed in the open air, responders should require layers of warm clothing beneath the coveralls that can still keep them warm during the DECON process. If DECON line workers are kept warm and alert; they will be able to work quickly and get the responder into the safety of the ship as quickly and safely as possible without contaminating the COLD zone.
- The shelters were effective in providing a clear barrier between the HOT zone and the COLD zone; but it is recommended that a DECON line worker be stationed at each DECON shelter, so that he/she can monitor the ingress/egress of workers.
- To provide additional protection for the COLD zone from oil contamination, a berm should be placed between the DECON area and the door to the COLD zone.
- During the DECON demonstration, it was observed that DECON waste can accumulate quickly, especially when more than four responders are involved. It is recommended that large, hard plastic containers (minimum 30-gallon volume) are used to store contaminated gear/PPE during the DECON process. Although deck space is at a premium during an oil spill response in Arctic conditions, some space will need to be made for the storage of contaminated PPE (hazardous waste) until the ship returns to port and they are properly disposed of. Also during the demonstration, it was observed that the collapsible trash cans made of thin plastic were flimsy and needed to be tied down. They were easily knocked over when heavy PPE was thrown in.
- It is recommended that the DECON line workers are kept as warm as possible and brought out to the deck only on an as-needed basis. Effective DECON can take place only if the DECON line workers are kept warm, well fed, and comfortable in between their work shifts, so they maintain a high level of alertness and effectiveness.

Overall

This final configuration of a future response system is based on requirements. The initial design for the response equipment used in Newport is for a WLB in Alaska that has to load a system into the hold before departing its homeport for a response in the Bering Straits or off the North Slope. Little to no response support would be available in such a remote location; so the design of the response system would need to be simplified for easy assembly and deployment. Suggestions, such as using the hold for oil storage rather than the on-deck storage, may be problematic in that the entire hold may have to be emptied. However, having such a system in the storage hold could increase storage capacity and keep the recovered oil warm. Thus, it will be easier to offload later.

A response system in the Great Lakes or First CG District could be designed with fewer components and stored on land in a warehouse. The design would be sized to be easily transported by truck or C-130 aircraft and taken pierside for onload to the responding WLB. However, this could be problematic for Alaska, as some locations may not have cranes or forklifts for heavy lift capability.

The revised DECON procedure will be published as an appendix in the upcoming RDC product titled “Federal On Scene Commander (FOSC) Guide for Oil in Ice”. Additional guidance for use of the IMS and TST will also be provided. RDC will work with stakeholders at CG Headquarters, the SILC Product Line and Districts 1, 9 and 17 to determine a recommended configuration. This type of system can also be used as a basis for commercial responders in putting together a cold-weather response package.

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APPENDIX A DOP-DUAL SKIMMER, ICE MANAGEMENT SYSTEM, AND TEMPORARY STORAGE TANKS INTEGRATION PLAN

DESIGN OF DEMONSTRATION

The equipment integration and deployment demonstration will take place on the buoy deck of USCGC JUNIPER while the ship is underway. The demonstration will serve to evaluate how well multiple pieces of equipment designed for oil spill responses in Arctic conditions are integrated and what limitations may exist. Lessons learned will be applied to equipment setup on VOOs and other U.S. Coast Guard vessels. Participants in the demonstration will also have the opportunity to train with state-of-the-art mechanical removal technologies designed for Arctic conditions.

Since the DECON demonstration can take place while the ship is tied to the pier, this equipment demonstration will be a priority and takes precedence when good weather occurs since because it requires the USCGC JUNIPER to be underway. A location where the deployment will be performed will be agreed upon between RDC and the Commanding Officer (CO)/Executive Officer (XO) of USCGC JUNIPER. Weather conditions that would prevent demonstrations from being held while underway include winds in excess of 20 knots and lightning. Wave height of approximately 1 foot or below would be preferred but is not necessary as low wave energy is expected in icy waters. Each equipment demonstration is anticipated to be approximately 4 to 6 hours in length and any deployed equipment will be recovered.

ENVIRONMENTAL CONSIDERATIONS

During this demonstration, no oil surrogates will be used. It is anticipated that temperatures in Newport during the month of August will be in the 80 to 90 degree Fahrenheit range. Safety precautions with respect to working in the heat need to be observed.

TECHNOLOGY CONFIGURATION

<u>DESMI DOP-Dual Skimmer with Helix Brush Adapter</u>

The DESMI Helix circular brush skimmer permits the oil to flow freely onto the brushes from any angle. It is reported to work well with heavy and thick oils that do not flow well. In this implementation, the large area of brushes is in contact with the oil layer, reportedly over 13 linear feet. A hydraulic motor provides power to rotate the brushes. The motor is mounted with a gearbox and a vertical positive displacement pump with a reported flow rate up to 100 cubic meters per hour (440 gallons per minute (gpm)) and can develop up to 10 bar (140 pounds per square inch (psi)) discharge pressure. See Figure A-1 and Table A-1. The full configuration of the DOP-Dual brush skimmer with the stainless steel chemical hose is shown in Figure A-2. A 108” x 88” x 91.4” ISU90 container will be included on the ship’s deck as well.

Figure A-1. DESMI DOP-Dual Skimmer with Helix brush adapter (left and center), control panel (right).

Figure A-2. Full configuration of DOP-Dual brush skimmer with stainless steel chemical hose (note that right photograph shows DOP-Dual with 3-inch hose).

Table A-1. DESMI DOP-Dual skimmer with Helix brush adapter information.

Specifications	
Draft	0.70 m (27.6”)
Skimmer pump	DS-250T vertical positive displacement Archimedes’ screw type
Maximum recovery rate	100 m^3/h (440 gpm) at 1 bar (14.5 psi)
Maximum pressure	10 bar (145 psi)
Materials	DS-250T pump
Floats, hopper and floating collar	Oil resistant polyethylene plastic (PE-HD)
Length	55”
Width	36”
Height	59”
Weight	176 lbs
Connections	
Hydraulic Supply	1” Aeroquip
Hydraulic Return	1” Aeroquip
Hydraulic Case Drain	½” Aeroquip
Helix Brush	3/8” Aeroquip
Discharge	6” Camlock or HydraSearch

Manufacturer’s website: www.desmi.com

Marine Pollution Control Ice Management System

The Ice Management System (IMS) is designed to avert or deflect ice in icy waters (30 to 70 percent ice coverage) to ensure that skimming operation is not impacted with small ice pieces from jamming the discharge hose. Fence panels can be replaced to accommodate the size of broken ice and the slot openings range from 2 to 8 inches. The IMS can be used interchangeably on several skimmers. Floats can be modified to acquire a desired freeboard height for optimal oil recovery operations. See Figure A-3 and Table A-2, which is taken from Reference 7.

Figure A-3. MPC Ice Management System deployed at Ohmsett.

Table A-2. MPC Ice Management System technical specifications.

Diameter:	13.2 ft
Fence height:	1 ft
Freeboard height:	≈ 3”
Weight (with floats, etc.):	881 lbs*
Slotted openings in fence:	8”/6”/4”/2”
Construction:	Aluminum
Float material:	HDPE
Float diameter:	26.5”
Float height:	20”
Buoyancy factor of each float:	≈ 270 lbs

*Listed weight includes strength components, which add 256 lbs to original weight (adds 88 lbs in water)

Manufacturer’s website: www.marinepollutioncontrol.com

ELASTEC Temporary Storage Tanks

Two temporary storage tanks (TSTs) will be installed on the deck of USCGC JUNIPER. Different layouts will be experimented with during the demonstration to determine where they may be the most secured and how they may be effectively used during intake and discharge. Personnel need to be able to access all features of the temporary storage tank with ease during operation or repair. One temporary storage tank will have a capacity of 3,900 gallons and the second will have a capacity of 4,800 gallons. Other key features include:

- Fast assembly
- Non-corrosive material
- Tough field-tested durability
- Venting system
- Grounding system
- Manhole access point
- Single 6” intake with aluminum plug and camlock assembly
- Dual 3” discharge located on opposite ends of tank with aluminum plug and camlock assembly
- Thermometer
- Compact storage

Figure A-4. Temporary storage tank setup on the deck of USCGC Elm, December 2014 (ELASTEC American Marine 2014)

Table A-3. Temporary storage tank specifications.

Capacity	3,900 gal (first TST) and 4,800 gal (second TST)	
Erected dimension	24 ft x 6.0 ft x 4.5 ft (first TST) and 30 ft x 6.0 ft x 4.5 ft (second TST)	
Intake	Single, 6" (aluminum plug and camlock assembly)	
Discharge	Dual, 3" on opposite ends of tank (aluminum plug and camlock assembly)	
	Urethane	
Base fabric	Nylon woven	
Weight	13 oz/yd^2	442 g/m^2
Coat weight	32 oz/yd^2	1,088 g/m^2
Grab tensile	600/500 lbf	2,670/2,220 N
Strip tensile	1,000 / 1,000 lbf	4,450 / 4,450 N
Method	ASTM D751-A Modified	ASTM D751-A Modified
Tongue tear	40/75 lb	178/334 N

Manufacturer's website: www.ELASTEC.com

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APPENDIX B COLD WEATHER DECONTAMINATION (DECON) PLAN

PURPOSE

The U.S. Coast Guard Research and Development Center (RDC) will be evaluating the efficiency of a dry decontamination (DECON) procedure to be carried out on USCGC JUNIPER for cold weather conditions.

BACKGROUND

RDC conducted a cold weather DECON procedure aboard two Vessels of Opportunity (VOOs) in November 2014 (Reference 6) and made strides in optimizing the efficiency of contaminant removal from responders and equipment without use of a traditional washing process. Lessons learned from the two exercises will be applied towards this demonstration so future Coast Guard cutters and VOOs may improve their personal protection equipment (PPE) and decontamination plans.

A typical DECON evolution has a COLD Zone (protected uncontaminated areas such as the living/eating quarters, bridge, or wheel house), a WARM Zone (a transition area) and a HOT Zone (contaminated area or work area). Operating during an oil spill in cold weather that may include below freezing temperatures or wind chill factors below freezing, does not permit standard DECON approaches that use a large amount of water and/or cleaning agents. Even with cold weather DECON, the collection of any liquids, either oil or oily water, is a major requirement.

The cold weather personnel DECON kit includes shelters, which are defined as enclosures that protect the user from the weather, coveralls (with hood and boot), utility and rubber work gloves, canvas stools, scissors, and snap hooks to name a few. See Figure B-1. The DECON kit is capable of providing personnel protection, enabling movement between zones, and performing DECON for personnel. The shelter and assorted equipment can be deployed on the deck of a CG cutter or a VOO to be used for the gross decontamination of crude and refined oils and other hazards such as dispersants. Each aspect of the DECON kit is easily deployable and disposable. All of the equipment in one kit can fit into a container that two people can carry (about 100 pounds) when unassembled.

Figure B-1. Cold weather DECON equipment in use.

OBJECTIVES

Perform a cold weather DECON procedure on the buoy deck of USCGC JUNIPER without using a traditional washing process and gather feedback from responders/participants for further optimization of the procedure.

1. Determine optimal locations of DECON stations and associated DECON equipment, taking into consideration where HOT, WARM, and COLD zones should be designated.
2. Perform dry DECON procedure with marker chalk as oil surrogate and identify issues with cold weather PPE or DECON equipment, if any.
3. Train support personnel in the deployment and use of cold weather PPE and DECON equipment.
4. Gather feedback/compile lessons learned and develop cold weather DECON plan for responders aboard a U.S. Coast Guard ship.

DESIGN OF DEMONSTRATION

The dry DECON procedure will be carried out at multiple locations on the buoy deck and may be performed while the ship is tied to the pier or underway, depending on what the schedule allows during the week of demonstration. It is estimated that a responder putting on the cold weather PPE will take 15 to 30 minutes and a complete dry DECON procedure for two responders may take approximately 30 minutes. The appropriate time to begin the DECON demonstration will be selected in coordination with the USCGC JUNIPER crew. Photographs will be taken during the dry DECON procedure.

ENVIRONMENTAL CONSIDERATIONS

For this evaluation, blue marker chalk will be used as an oil surrogate. It will be applied on the majority of the responder's body to mimic oil contamination acquired during oil spill response work. As the dry DECON procedure is carried out, responders will ensure that the blue marker chalk does not contaminate their inner clothing or travel to the designated COLD zone.

Temperatures in Newport during the month of August are expected to be in the 80 to 90 degree Fahrenheit range. Safety precautions with respect to working in the heat need to be observed, especially with responders who may don cold-weather gear to demonstrate limited flexibility during a DECON procedure.

COLD WEATHER PERSONAL PROTECTION EQUIPMENT AND DECONTAMINATION EQUIPMENT

Table B-1 shows the dry DECON equipment that will be used by multiple responders upon transitioning out of a HOT zone and into a WARM zone. Table B-2 shows the typical cold weather PPE that a responder is expected to wear in addition to a life jacket and inner layers necessary for working with oil spills in a cold weather environment on a ship. A station will be placed near a hatch that the responder is expected to enter in order to leave the HOT zone. In addition to all the equipment listed in Tables B-1 and B-2, responders will be aided by PPE managers as they proceed with the DECON procedure.

Table B-1. Dry DECON equipment for one location.

Quantity	Item
1	Grayling 77" D-CON shelter (36" x 36" x 77") or 81" D-CON shelter (48" x 48" x 81")
1	77" or 81" Grayling D-CON pole set (8 poles)
1	Collapsible canvas stool
2	Collapsible waste receptacles
3	Extreme duty bags, 73” x 36”
3	PCXM 55" x 45" x 73" plastic bags
2	Multiple large clear plastic zip-lock bags
1	Misc. parachute cord
3	Misc. snap hooks
1	5/16” 15ft black polyline w/ snap hooks
5	Hook & loop fabric cable ties
2	Green bungee cords
8	Terry cloth rags
1	Pair scissors
1	Talon rescue knife
1	Triangular red safety LED lights
1	Hand-held mirror
6	Chem lights
6	Pairs disposable green vinyl gloves

Table B-2. Cold weather PPE for one responder.

Quantity	*Item*
1	Size XL/XXL Kleenguard coveralls w/ hood & boot
1	Hard hat
1	Hard-hat windsock, ear/face
1	Clear plastic safety glasses
1	3M disposable ear plugs
1	Disposable respirator
1	Pair cotton utility gloves
1	Pair PVC coated orange rubber (lined) work gloves
1	Pair Safety Boots
1	Pair non-skid boot/shoe covers, gray

GENERAL DEMONSTRATION PROCEDURES

SETUP PROCEDURES

Step	Setup Procedures
Step 1	Carefully consider safety, available deck space, visibility, and crew movement during cleanup operations and decide upon locations of the HOT zone, WARM zone, COLD zone, and DECON stations.
Mark Contamination Control Zone	
Step 2	1. Using the contamination control zone marking tape, mark off the HOT, WARM, and COLD zone boundaries. 2. Determine the best foot traffic flow to prevent cross contamination.
Establish Station No. 1 - Gear Drop	
Step 3	Designate a location for workers to place contaminated gear, such as hand-held tools, as they begin the dry DECON process.
Erect the DECON shelter at Station No. 2 - Dry DECON	
Step 4	1. Erect the DECON shelter at Station No. 2 - Dry DECON, on a boundary line between the HOT and WARM zones. a. Sweep and clear the area where the units will be setup, then cut and lay a protective layer of plastic sheeting on the deck. b. Unfold the shelter and stand it vertically by lifting the top panel through the entry. c. Enter the unit and insert the pole set. d. Position and tension the poles into the corners in the recessed slots on the base and top panels. 2. Set up portable lights inside shelter. 3. Place disposable gloves inside shelter. 4. Place sorbent pad inside shelter. 5. Place receptacle inside the shelter.
Set up Station No. 3 - Redress and Monitoring	
Step 5	Establish Station No. 3 at the exit of the DECON shelter: 1. Set up portable lights. 2. Place disposable over-garments, gloves, and footwear and sorbent pad inside shelter within reach.
Set up Station No. 4 - COLD Zone	
Step 6	Establish Station No. 4 at the entrance to the vessels clean area: 1. Set up portable lights. 2. Place disposable over-garments, gloves, and footwear and sorbent pad inside shelter within reach.

PROCEDURES FOR USE

Station	Procedure
Station No. 1 - Gear Drop	1. Place handheld contaminated tools or equipment in the designated gear drop receptacle or area for re-use (e.g. unneeded load bearing equipment, wrenches, screwdrivers).
Station No. 2 - Dry DECON	1. Step inside DECON shelter and: a. Remove gross contamination on the surface of outer clothing and body worn PPE with the sorbent pads. Dispose of sorbent pads and any expended items in waste receptacle. b. Place contaminated items intended for re-use outside the DECON shelter in the HOT zone. c. Carefully remove contaminated over-garments avoiding cross contamination and either place them in designated receptacle or if intended for re-use, stow accordingly in the HOT zone. d. Carefully remove contaminated footwear and either place it in designated receptacle or if intended for re-use, stow on the HOT zone side. e. Contaminated gloves should be removed last and placed in the waste receptacle in the DECON shelter. If this is not feasible without gross contamination occurring, then use the disposable gloves located in the shelter as needed.
Station No. 3 - Redress/Monitoring	1. While removing contaminated footwear in the DECON shelter, enter Station No. 3 with clean footwear one at a time. 2. While removing contaminated footwear in the DECON shelter, step out of the DECON shelter onto the sorbent pad on the deck. a. Don the disposable over-garments, gloves, and footwear, as necessary in order to move cleanly toward the COLD zone. b. Replace sorbent pad on the deck and exit toward the COLD zone.
Station No. 4 - COLD zone	1. Arrive at the entrance to the COLD zone and: a. Ask a coworker to look for any remaining contamination before entering the COLD zone. b. Remove remaining contamination using sorbent pads and disposable over-garments, gloves, and footwear. c. Enter the COLD zone and dispose of temporary gloves and footwear as needed.
System Disposal	To dispose of the system, place all contaminated materials and systems components in the DECON trash liners and seal them in a safe location for further waste processing upon arrival ashore.

PERSONNEL REQUIREMENTS

- 4 responders (4 USCGC JUNIPER crewmembers); 2 responders per station.
- PPE managers (1 USCGC JUNIPER crewmember and 1 RDC employee) to assist with DECON procedure.
- 1 photographer to record DECON evolution.

DATA REQUIREMENTS

- Collect observation notes, general feedback and lessons learned.
- Take photographs throughout DECON procedure.

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APPENDIX C USCGC JUNIPER (WLB-201)

WLB JUNIPER and Full Tank Arrangement

Figure C-1. USCGC JUNIPER.

Vessel Particulars:

General Characteristics

Length:	225 ft
Beam:	46 ft
Draft:	13 ft
Displacement (Full Load):	2,000 tons
Speed	16 kn
Buoy Deck Area:	2,875 ft^2
Crew:	44
Officers:	8
Enlisted:	36
Icebreaking:	14” plate ice at 3 kn, 3 ft backing and ramming
Oil Spill Recovery:	400 gallons per minute

Equipment

Main Engines:	2 CAT 3608, 3100 HP Diesel Engines
Propulsion:	10 ft diameter Controllable Pitch Propeller
Bow Thruster:	450 HP Fixed Pitch Electric Thruster
Stem Thruster:	550 HP Fixed Pitch Electric Thruster
Generators:	2 CAT 3406 Diesel Engines
Buoy Crane:	20-ton Hydraulic, 60 ft Boom
Small Boats:	22 ft RHIB, 24 ft Aluminum Workboat

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